IN THE MATTER of US Patent Application No. 09/319,764

FILED IN THE NAME OF: HOUGHTON, Bradley
JEROMSON, Peter
WILKINSON Jamie
BARNES Peter, and
RUTTEN, Giscard

AFFIDAVIT OF PETER JAMES JEROMSON

IN SUPPORT OF THE APPLICATION

I, Peter James Jeromson, of Auckland, Engineer and Company Director, of 5B Bleakhouse Road, Howick, Auckland, New Zealand, swear:

1. I am one of the inventors named in the above US patent application, which derives from an international patent application filed as PCT/NZ97/00168 and published as WO 98/26339.

2. That patent specification is entitled Valve System for Servo Control of Fluid Flows.

3. I am a Director and Shareholder of Emech Control Limited. This company was previously called Technology Control Limited, prior to that it was called The Unique Company Limited. My company under its then name The Unique Company Limited was the original applicant of PCT/NZ97/00168, which in turn derives title from New Zealand patent application number 299927 dated 12 December 1996.

4. My company was incorporated in 1994 to develop and market electronic and mechanical inventions with specific initial intention to develop an electronic, hot and cold water mixing valve for use in a personal shower or bath.

5. A valve was developed in two stages: (a) as a consumer valve for mixing hot and cold water for a home shower or bath, and (b) for industrial control. Initially our intentions were to develop a valve with very low torque and by doing this we ended up with a valve that was easily scalable opening up applications in the industrial valve market.

6. The main difference between the two applications being the size of the valves, and certain market feature requirements, more

7. I have annexed hereto marked with the letters "**PJJ-1**" a brief summary of my work history.

8. Setting out to design electrical mechanical valves for both the consumer and industrial control markets, we had a number of commercial considerations in mind. These included:

 (a) commonality between all valves there is: A Disc set, Sensor, Stepper motor, controller and interface;

 (b) the makeup of the above features together provides an extremely reliable, accurate and mechanically simple solution for fast control. We are able to offer an electronically intelligent valve for the same price;

 (c) mixing valves are good for microprocessor control as changes in 2 inlet pressures, temperatures and flows can all be compensated accurately within the valve. Mechanical mixers are not as accurate and are not able to know whether the output temperature is correct or not. Essentially the complexity is removed from the mechanical mechanism and dealt with by the software which is and this is cost tune, change or update, even after the valve is installed.

 (d) a balance of high performance at low cost was the main requirement in the design from the beginning;

 (e) having the ability to scale up the valve whilst minimising the torque requirements to control the valve,

 (f) the ability to minimise "stiction" between the valve components ("stiction" is effectively the amount of additional torque required to get the outlet valve disk moving against the friction between the valve components and the water pressure applied to the components when the valve is closed).

 (g) mechanical simplicity means less parts which means a more reliable valve. Sales have commenced and a significant number of sales have been due reliability problems with conventional valves.

9. After the initial investigations into proportional diaphragm valves, we started by investigating ceramic disk control valves. Our design marries disks with electronic rotary control. Although at the time hand operated ceramic disk valves were common in the plumbing industry, they were used in faucets, where a ceramic valve disk was rotated with respect to a valve seat, by manual control of the faucet. In such applications

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"stiction" between the valve disks is not considered to be a problem because most people can provide far more torque than is required to commence movement of the rotatable disk with respect to its stationary valve seat.

10. Ceramic disk valves were not used in the industrial control valve industry, to my knowledge. I am unaware of any other electronically controlled ceramic disk valves used in industrial process control.

11. I will discuss the prior art cited by the Examiner, and located by other patent offices, later in this affidavit, but in general I believe that prior art patents relating to the use of ceramic disk valves have been directed to domestic applications i.e. the mixing of hot and cold water for showers, baths or the like. I have not found reference in any of the patents to the use of such valves in industrial process control.

12. In setting out to design our valve we followed the following design rules which govern the size and layout of the components during design:

 (a) maximise flow,

 (b) minimise disk diameter,

 (c) minimise actuator size, and

 (d) minimise parts.

 (e) ease of manufacture

 (f) minimise parts

13. Annexed hereto marked with the letters "**PJJ-2**" is a drawing of our rotating disk, and two versions of our fixed disk (valve seat) labelled Fixed Disc A and Fixed Disc B, which drawings are taken from our US patent application.

14. Annexed hereto marked with the letters "**PJJ-3**" is a digital photograph of conventional two port discs being the two views shown at the top of the photograph and the three port discs manufactured for my company as will be discussed below. It will be apparent that the rotating disc in the darker colour at the bottom and the valve seat disk at the bottom right is equivalent to the drawing of Fixed Disc B shown in the exhibit "**PJJ-2**.

15. When we set out to develop our three port mixing valve we thought we would be able to purchase commercially available discs suitable for use in that valve. We were wrong. A

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worldwide search was conducted by my company in 1997 to specifically look for a single spindle three port disc set corresponding to the drawings in our patent application and shown in exhibit **PJJ-2**.

16. We assumed that the three port discs would be a natural progression from the two port discs which are made in the millions by most ceramic companies (see the two components shown at the top of exhibit **PJJ-3**).

17. This search failed to reveal anything suitable for use in our three port valve design. We have contacted the major manufacturers of ceramic discs including Morgan Matroc of the UK, CICE of France, Corrstek of USA as well as several Italian companies. As a result we were forced to tool up ourselves to produce our specially designed discs for use in our three port valve.

18. The geometry of our disc set is very important. The following table sets out the relationship of the shape to the advantages resulting from the geometry of the disc set.

The ratio of the orifice area to outside diameter is minimised	Reduces friction, smaller motor, smaller motor, cheaper.
Minimise the applied pressure area to the closed valve disc set.	Reduces load on the spindle decreasing Torque to open which is always the greatest torque required of the motor.
The sector shape minimizes the sealing area between the ports.	Minimises the effect of this area to the control curve.
Allows for the single axial rotating of the disc to completely cover both inlet orifices.	Allows shut off in addition to temperature control with the single motor.
The design is practical to scale. Larger discs are exponentially more difficult and expensive to produce.	Allows wider ranging larger industrial applications, i.e. process control. Minimised diameter means minimised torque.

The design is economical to scale.	Ceramic disc pricing is volume based i.e. minimised diameter = minimised volume = minimised cost.
The second disc does not need to be fully round i.e. has a cut out portion.	Allows more flow and minimised volume is cheaper to produce.

19. One of the most important advantages is that our geometry reduces the applied open/shut-off force and resulting friction between the components allowing for a smaller motor to be used as the servo, allowing for a more compact, and cheaper construction.

20. I have previously mentioned that "stiction" between the moveable valve disc and the valve seat is a problem to be overcome, and it is very important in the case of our valves that we use our geometry to minimise stiction, as this enables us to use a smaller, cheaper motor to rotate the main valve disk relative to the valve seat to provide precise and smooth control allowing the valve disc to be rotated between a series of positions in which it can shut off both inlet apertures i.e. both the hot water inlet and the cold water inlet can be closed so that there is no flow through the valve, to a first open position in which the sector shaped aperture in the valve member commences to open the first inlet aperture, then to move to position the sector shaped aperture in the valve disk over both the first inlet aperture and the second inlet aperture, and then to a position where the first inlet aperture can be closed as the valve disc continues to rotate, and the second inlet aperture can be fully opened, and then rotation in the reverse until the valve disc returns to its fully closed position.

21. In practice the servo motor of our temperature mixing valve will quickly rotate the outlet disk to the middle mixing position then incrementally rotate the outlet disk clockwise and anticlockwise respectively in response to variations in the output temperature.

22. Having developed our valve geometry, and produced our own valve discs, we further refined the valve, by reducing the required torque to open the valve against shut off pressure. When the valve moves from the fully closed to the partly open position, the torque required to move the valve is considerably greater than the torque required to move the valve between one mixing position and another. As soon as the valve is opened, the pressure drops on the upstream side, and the torque required

to move the valve disc is considerably reduced. By refining the valve to reduce the starting torque, we were able to use a low cost, low torque stepper motor of the type used in the printer market. Such a stepper motor was a proven reliable product, and because it was mass produced, and operated under low torque, was very well priced. We further refined the valve by reducing the upstream area exposed to the bottom disc.

23. During the testing phase of our shower valve, a process control engineer who observed the valve asked if it could be scaled up to solve tempered water fluctuation problems in industry. Slugs of hot and cold water in a plant ring main can cause plant shut downs, reducing efficiency, or destroy product.

24. Prior to our valve, a factory engineer would have to buy a diverting valve or 2 flow valves, a sensor and a PLC (programmed logic controller). The factory engineer would then put all of them together and try to tune the circuit with the sensor well downstream to provide automatic control. This can be difficult to install, expensive and have slow performance. It can be more unreliable because of the remote controller which is sending a stream of control information and not just a set point or required temperature.

25. We were able to scale up our shower valve to develop and offer for sale a "plug and play" option with intelligence at the valve to make the unit more reliable. The control loop speed is also extremely fast as the temperature sensor and loop circuit components are in the valve itself. This has since proven to be a successful product for industrial applications.

26. Scalability of our disc geometry allowed large industrial versions to be built. I have annexed hereto and marked with letters **PJJ-4** a digital photograph showing a series of valve discs, with a small shower valve disc to the left. The four industrial valve discs to the right are designed for nominal bore pipe line sizes of 3/4" to 2.5". Further technical information on the industrial valve is available on our website at www.emechcontrol.com. Details of some of our industrial valves are shown in our brochure, a copy of which is annexed hereto marked with the letters **PJJ-5**.

27. The ceramic manufacturing process requires the compression of ceramic powder at very high pressures. Increasing the size of the disc requires a larger press. There are vast number of manufacturers that are able to manufacture the conventional ceramic discs for the plumbing industry (the discs up to 1.5" in diameter). Very few of these manufacturers are able to manufacture discs to the size required for a 2 inch valve, which

requires a disc of a diameter of 2.743 inches. We only located one manufacturer (Coorstek) in the USA able to produce such a large diameter ceramic disc at a reasonable cost.

28. I have annexed hereto and marked with the letters **PJJ-6** a photographic history of the development of this valve showing examples of the original electronically controlled shower valve, and an earlier example of one industrial control valve.

29. Maximum flow for a minimal diameter is an important requirement for efficient manufacture and operation of such valves.

30. By using two substantially sector shaped apertures in the valve seat, which are close together, and effectively occupy about half the available area of the valve seat, we are able to provide a smooth and more linear response which on analysis may not be achieved with some of the other prior art disc valves known to me. I have annexed here to marked with the letters **PJJ-7** the response curve for the valve of our invention having a moveable valve disc similar to Figure 3 of our US patent application, and a valve seat similar to Figure 5 of our patent application. In respect to a hot water mixing application this plot demonstrates the direct proportionality between angle and the output temperature characteristic expressed as a percentage of available hot area over the respectively available total area (hot plus cold). The valve seat currently produced used the two 90 degree sector shapes for the inlet apertures as shown in the digital photograph of the shower valve and industrial valve discs of exhibit **PJJ-4**

As set forth in our new claims 1, the characteristic of our valves is this combination of the inlet ports together with the sector shaped aperture in the moveable valve member, and the sealing area of the valve member being greater than or equal to the confined area of the two adjacent inlets substantially sector shaped apertures, so that the ceiling area of the valve member can cover and close the two adjacent inlet substantially sector shaped apertures. I have referred to the inlet apertures as substantially sector shaped, as they do not form true sectors of the radius of the valve disc, as it is important there is a small area of "land" between the adjacent inlet apertures to separate the inlet and outlet passageways. These "sector shapes" increase in area towards the periphery of the disk so that flow rate is maximised within the physical limitation of a rotatable disk.

31. I have reviewed the prior art cited by the Examiner, and have been asked to comment in particular on SAETHER patent # US4,611,757. I have annexed hereto and marked with the

letters **PJJ-8** my analysis of the SAETHER patent. I realise that my comments are based on my analysis of the SAETHER disclosure and drawings when compared with the disclosure and drawings (not the claims) of our patent application. I will leave it to our attorneys to comment in detail on the prior art.

Sworn at Auckland this 26th day of April, 2004)
)
Before me: N. Bannister)
)

NATALIE SARAH ETHEL BANNISTER.

A Solicitor of the High Court of New Zealand

This is the exhibit marked"PJJ-1"
referred to in the affidavit of
Peter Jam s Jeromson
sworn before me this 26/04/2004

N. Bannister NATHLIE SARAH ETHEL BANNISTER
Solicitor of the High Court of New Zealand

Work History
Peter Jeromson / The Unique Company / Emech Control.

Qualifications

- I have a trade qualification 8000 hr apprenticeship in fitting, turning and machining.
- A New Zealand Certificate in Mechanical engineering.

Employment

1) 1980 – 1984. Apprenticeship: A&G Price Ltd Thames. General heavy engineering foundry and workshop. Work involved mechanical machine assembly, machining of large castings and mechanical darfting in the design office.
My NZ certificate of engineering was also completed over this period of 4 years part time.

2) 1985 – 1992 New Zealand Americas Cup Challenge.
Perth Australia, Auckland New Zealand and San Diego USA. My commitment in 3 campaigns full time, building, trialing and maintaining on board systems with a personal responsibility for maintaining the hydraulic systems.

3) 1992 – 1996. Jeromson Engineering Ltd (JEL)
I set up a workshop to provide general machining services to the marine industry. At this time I also became involved in high quality machining of Aluminum and stainless steel parts for food packaging machinery.

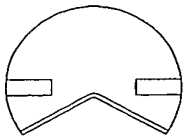
1996 – Present. Stainless Technology, The Unique Company (Emech)
Merged JEL with Stainless Technology to fabricated and assemble food packaging machinery. Built under contract this machinery was sent all over the world.
Founded the Unique company with 2 other partners to develop electro-mechanical valves. See current Web site: www.emechcontrol.com

The Unique Company background (Now Emech)
1994 – 1998
An electronic mixing valve was developed over a period of 4 years to supply accurately tempered water to a personal shower or bath. This product had the absolute requirement to be affordable and in the same price bracket as a conventional, reasonably good quality hand adjustable mixing valve.

1999 – 2003
The valve technology was scaled for the industrial market for control of hot water in both mixing applications and flow control.
Current development projects are expanding our range to control steam.
Our core competency remains our ability to electronically control accurately with

This is the exhibit marked"PJJ-2"
referred to in the affidavit of
Peter James Jeromson
sworn before me this 26/04/2004

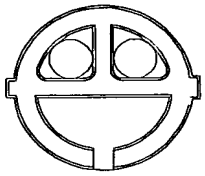
N Bannister. NATALIE SARAH ETHEL BANNISTER.
Solicitor of the High Court of New Zealand



ROTATING DISC



FIXED DISC A



FIXED DISC B

This is the exhibit marked "PJJ-5"
referred to in the affidavit of
Peter James Jeromson
sworn before me this 26/04/2004

Solicitor of the High Court of New Zealand

FLOW CONTROL + ACTUATOR SYSTEMS

emech
control

UNCERTAIN

AND FLOW

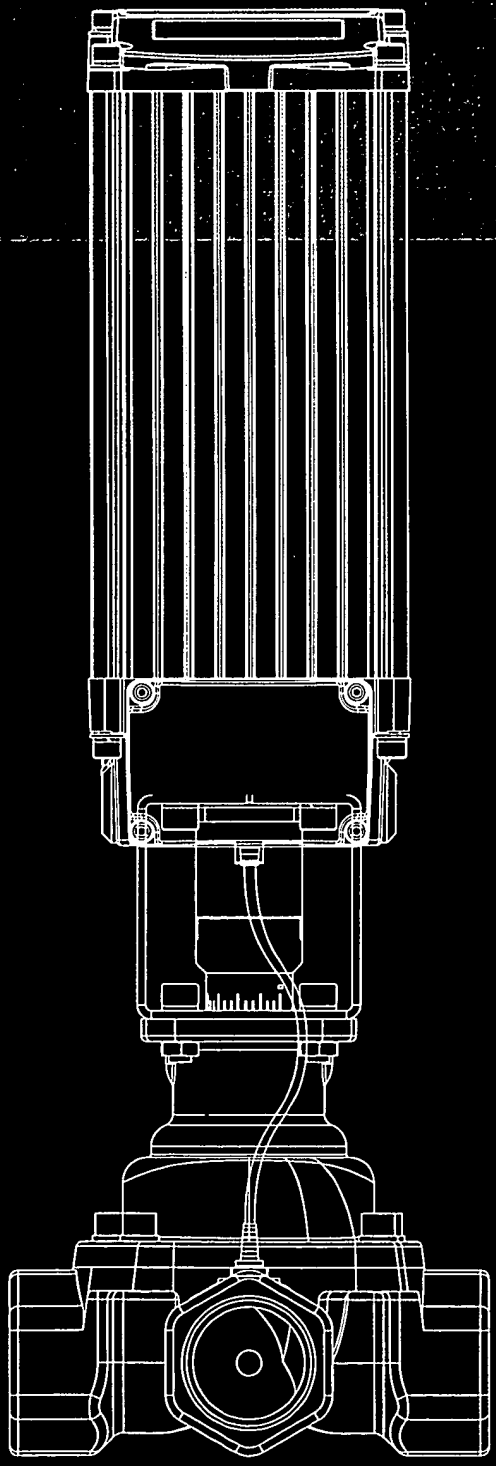
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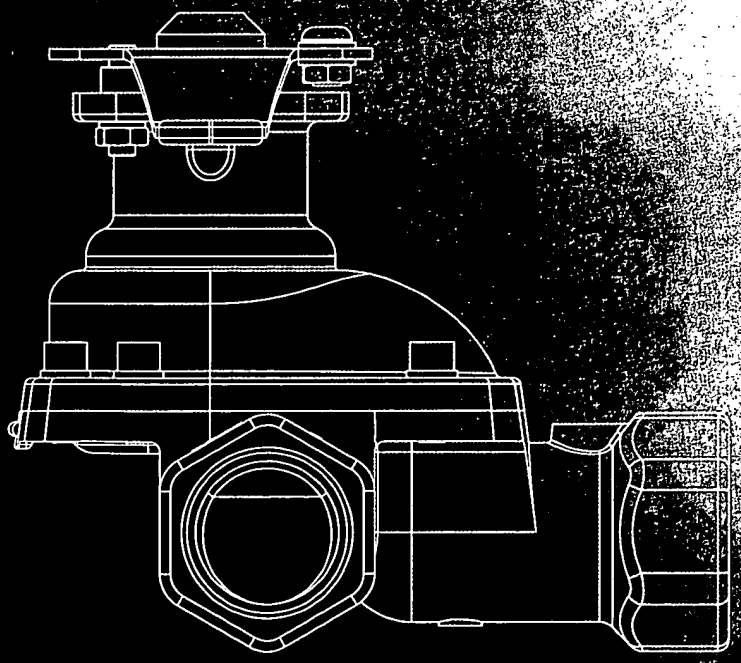
Introducing the new industry standard in flow control. The Emech™ Control range of disc valves and actuators.

Emech™ technology has been proven in the meat processing, leather and pharmaceutical industries, further applications in pasteurization in the dairy industry and mash water temperature control in the brewing industry are now providing improved product quality and saving in energy costs.

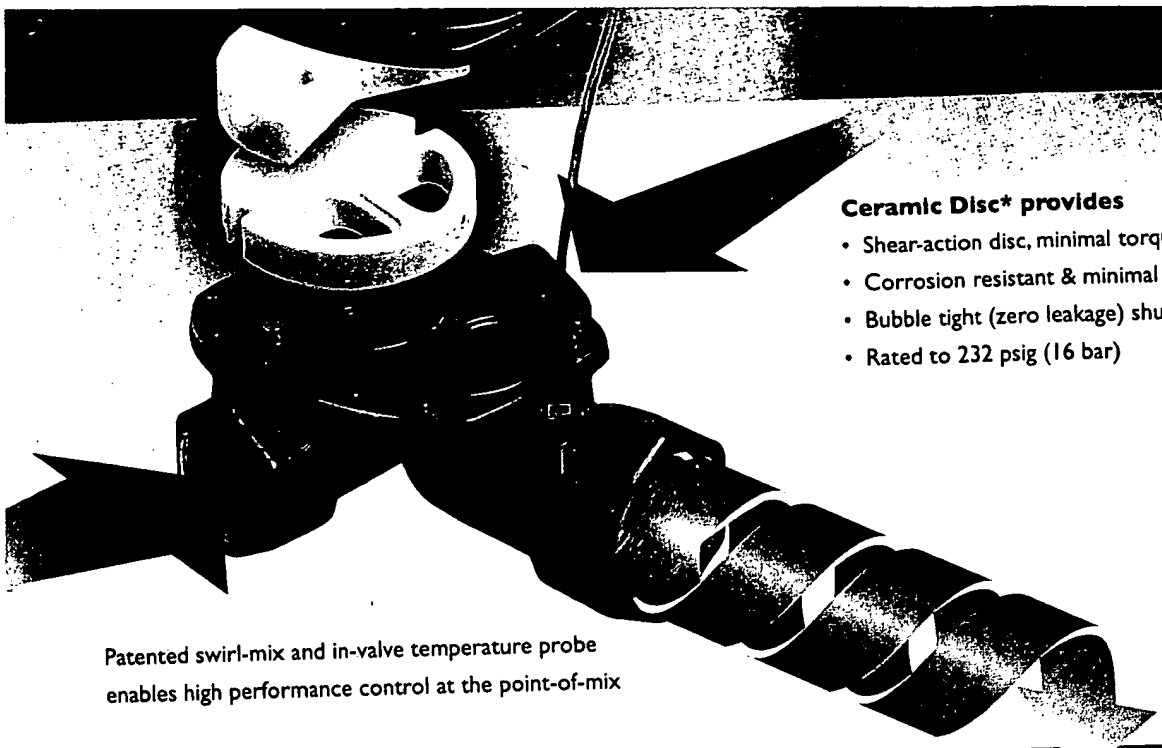
Fast, smarter and simple, with one goal in mind.

ABSOLUTE PRECISION





INTERNATIONAL PATENTED DESIGN



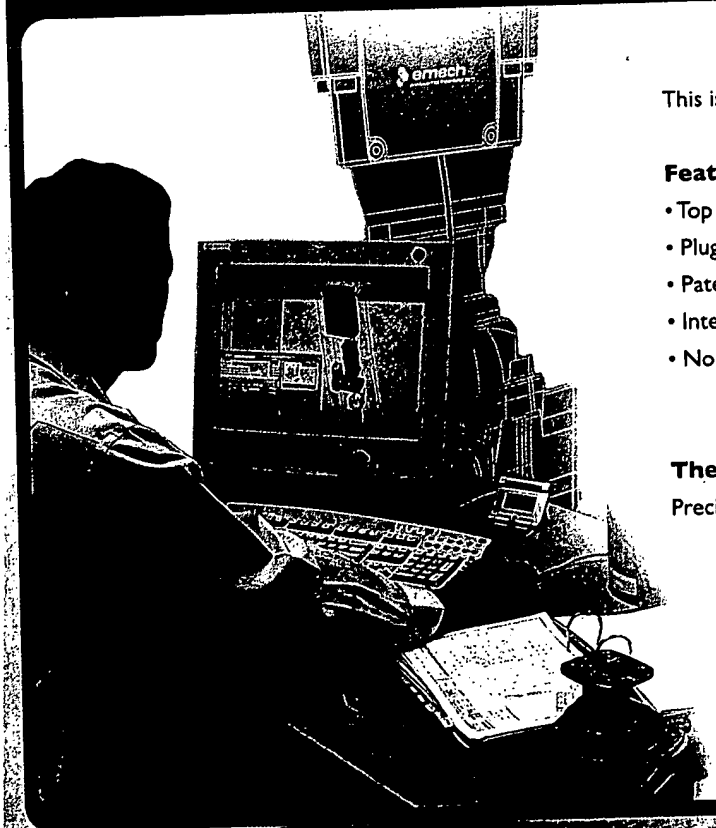
Ceramic Disc* provides

- Shear-action disc, minimal torque requirement
- Corrosion resistant & minimal wear
- Bubble tight (zero leakage) shutoff
- Rated to 232 psig (16 bar)

Patented swirl-mix and in-valve temperature probe enables high performance control at the point-of-mix

*Available model F2 & F3 only

THE VALVE



This is a world beating valve system that provides a superior standard in fluid control

Feature

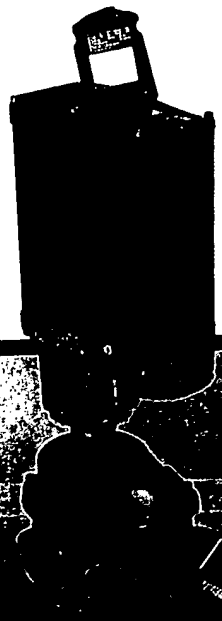
- Top entry design
- Plug and play installation
- Patented swirl-mix
- Integrated temperature probe
- No balancing valves required

Benefit

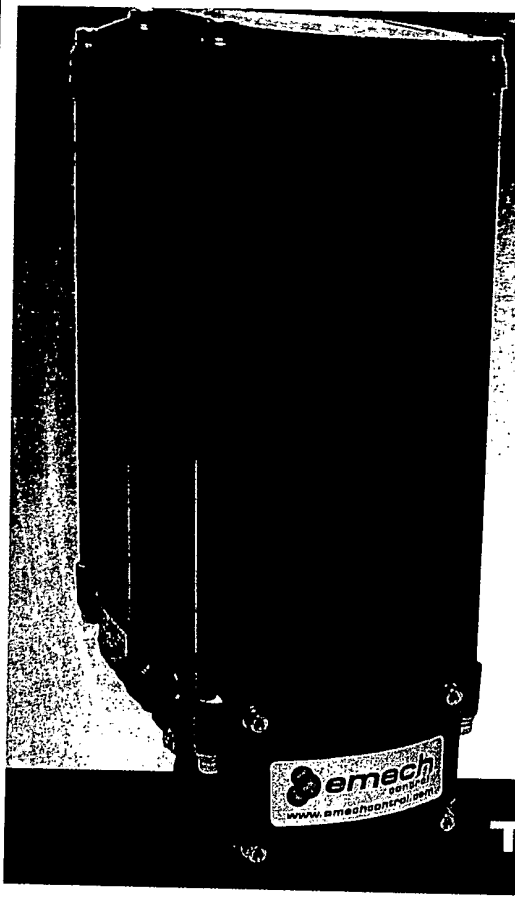
- Easy maintenance
- No external PLC/Probe/Controller required
- Provide accuracy to +/-0.9°F (0.5°C)
- No 'hunting'
- Can achieve temperature mix at unequal pressures up to 20:1

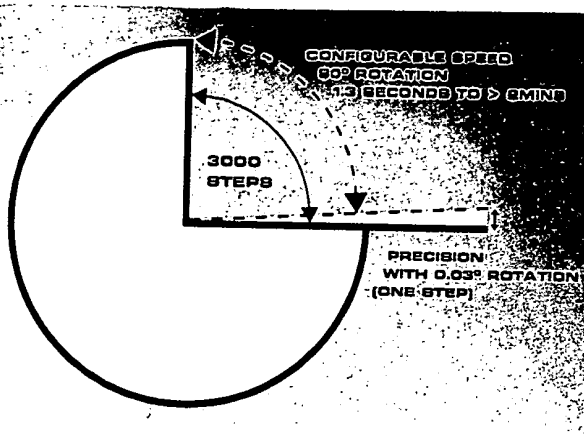
The result

Precise flow control and unsurpassed accuracy



MIXING WITH A DIFFERENCE ABSOLUTE PRECISION

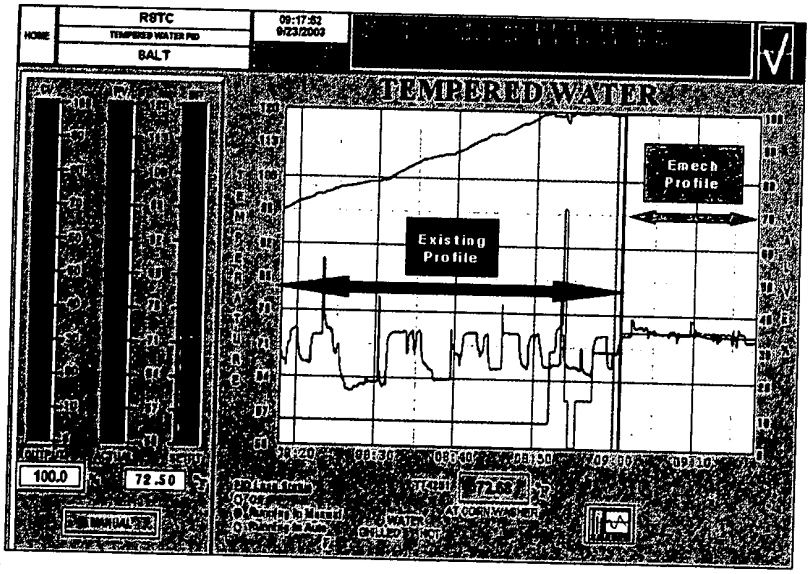




The Emech™ Actuator offers a new dimension in control

- High speed and user configurable, controlling a 90° swing from 1.3 seconds to greater than 2 minutes (3000 steps)
- Precise positioning achieving 0.03° disc placement with each step
- Integrated closed loop controller
- Two operating modes - either local stand alone control or remote control via 4-20 mA set -point signal

THE ACTUATOR



The graph opposite compares water temperature supply at a US food manufacturing facility between a traditional pneumatic operated plug valve and the Emech™ system. Both systems were installed in parallel and switched to compare the different performance.

The existing control system provided poor response to pressure fluctuations, yet when the system was switched to the Emech™ system, the resulting temperature variation was minimal.

THE NEW EMECH™ STANDARD VS TRADITIONAL SYSTEMS



EMECH™ ROTARY VALVE

- Emech™ rotary shear action is smooth and precise
- Low torque requirement improves precision & control
- Maintenance is simple. Top entry eliminates the need to remove the valve
- Standard O-Rings is required for maintenance

TRADITIONAL LINEAR VALVE

- Traditional linear action promotes seal wear, increases maintenance and leakage
- Linear valves suffer stiction (jerky-valve action)
- Maintenance is difficult, requiring valve removal

EMECH™ ELECTRONIC ACTUATOR

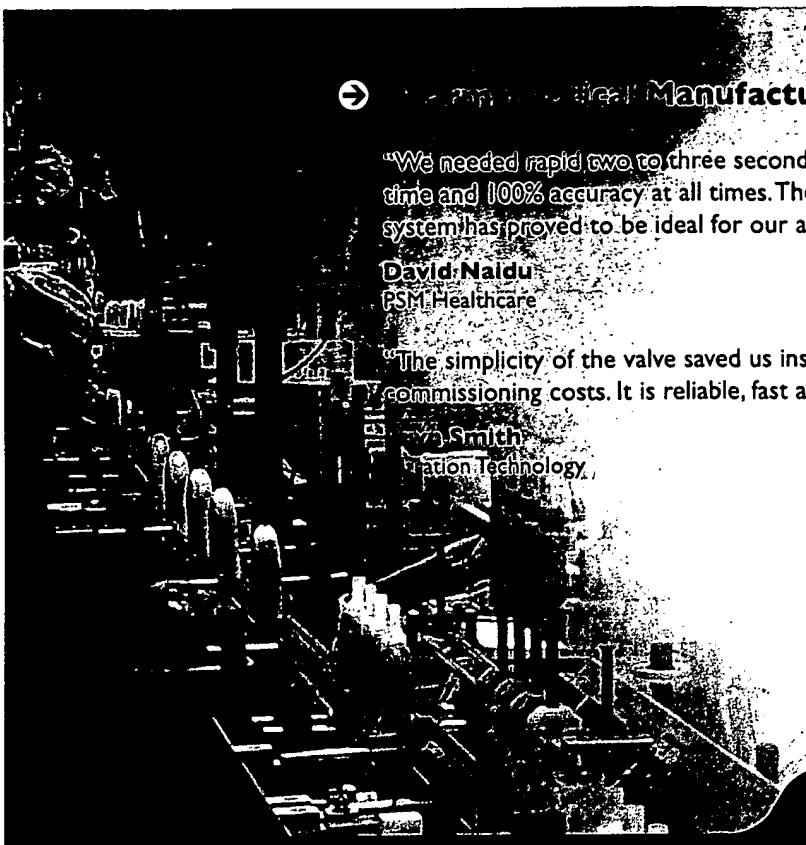
- Integrated closed loop controller (Temperature & Position)
- Setpoint selectable from remote current loop or local keypad
- Manual over-ride is standard
- Electronic operation provides immediate response
- High speed stepper-motor offers precision control to 0.03° resolution (3000 steps for a quarter turn)

TRADITIONAL PNEUMATIC ACTUATORS

- Accessories required, including external hardware and technical commissioning
- Setpoint selection from local keypad is not available
- Manual over-ride is optional extra
- Pneumatic operation is limited by time taken to build air pressure to create shaft movement

The in-valve sensor and patented swirl mixing provides accuracy and fast response. The one-unit system offers true "plug and play" applications, saving installation costs.

Emech™ is Fast, Smart and Simple, with one goal in mind.
Absolute precision.



Manufacturing

"We needed rapid two to three second response time and 100% accuracy at all times. The Emech system has proved to be ideal for our application"

David Naidu
PSM Healthcare

"The simplicity of the valve saved us installation and commissioning costs. It is reliable, fast and accurate"

V.J. Smith
Filtration Technology



The shear-action ceramic disc and optical encoder provides unsurpassed levels in fluid control, and the G1 actuator's ensures failsafe positioning.
Ceramic disc patented design.

THE SOLUTION



Meat Processing

"With the new Emech system, we've been able to save energy and water. Most importantly, we've removed disruption to the killing chains"

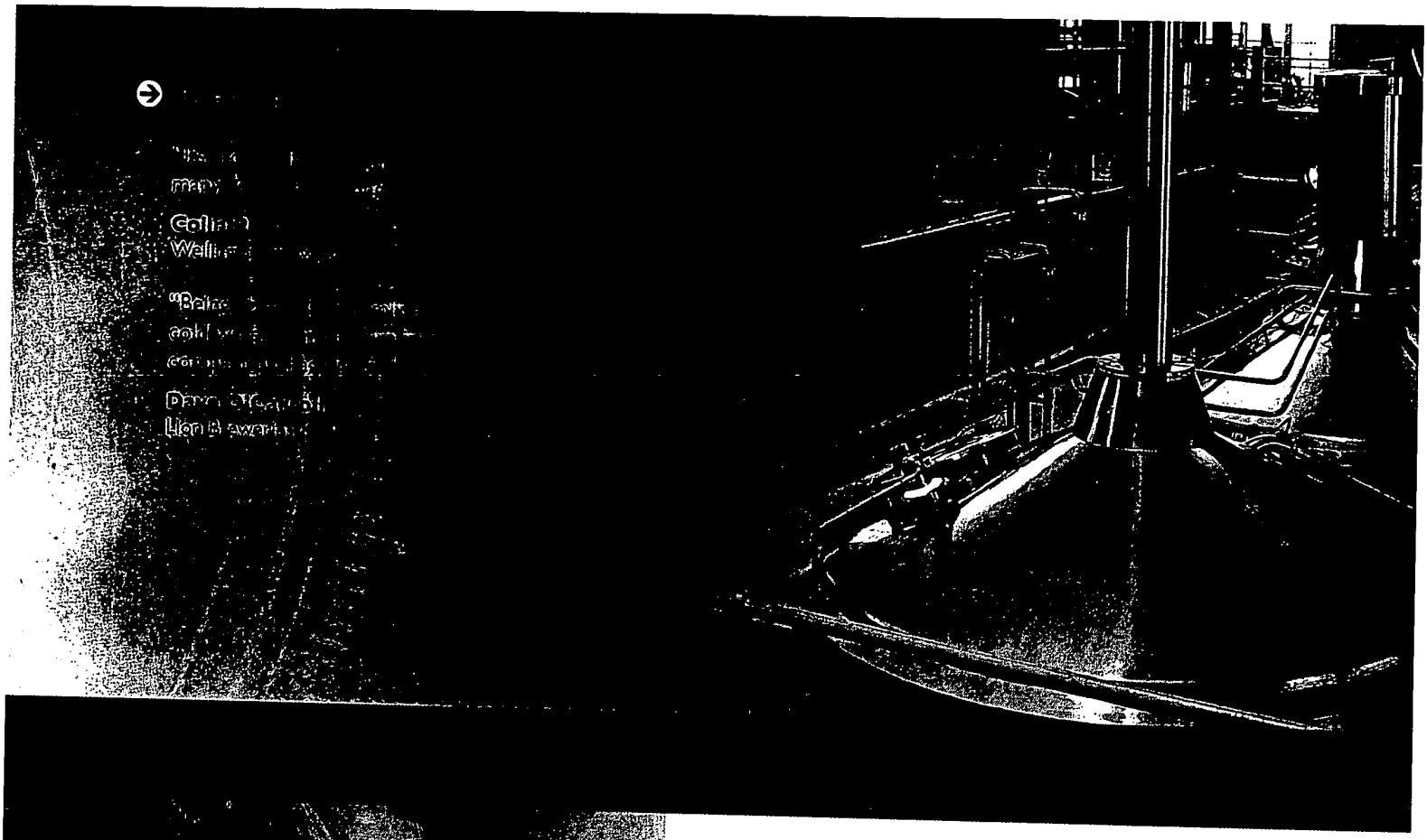
Ray Jenkins
Richmond Corporation

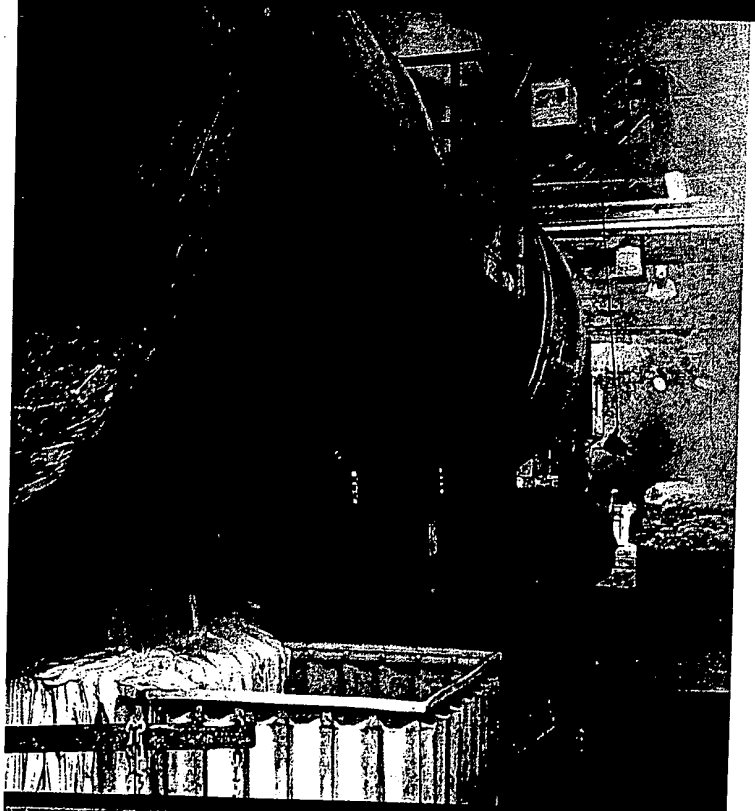
"The installation of the system was quick and easy, now providing exceptional results"

Daren Box
Cargill Foods Inc.

"We can control water temperature to <1°F, saving energy as well as increasing our yield"

Roger Schreiner
Excel Corporation





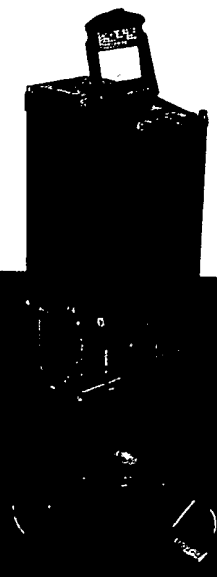
Leather Processing & Tanning

"The Emech system is ahead of its time. Payback has been achieved in less than 3 months. Its performance defies logic"

Pat Bennett
Te Aroha Skin Processors

"This system adds real value to the world-wide tanning industry by reducing water and heating costs as well as improving product quality"

John C Crowther
Swystem Logic GmbH.



Emech Valve Specifications

Valve Figure Number		2-Port Control Valve				3-Port Mixing Valve				
		F2	F2	F2	F2	F3	F3	F3	F3	F4
Nominal Valve Size	U.S (Inch)	3/4"	1"	1 1/2"	2"	3/4"	1"	1 1/2"	2"	3"
	Metric (mm)	*20mm*	*25mm*	*40mm*	*50mm*	*20mm*	*25mm*	*40mm*	*50mm*	*80mm*
Inlet/Outlet Size	U.S. (Inch)	3/4"	1"	1 1/2"	2"	3/4"x1"	1"x1-1/4"	1-1/2"x1-1/2"	2"x2-1/2"	3"x3"
	Metric (mm)	*20*	*25*	*40*	*50*	*20x25*	*25x32*	*40x40*	*50x65*	*80x80*
Pressure Rating	U.S. (psi @ 212F)	145	145	145	145	145	145	145	145	110
	Metric (bar @ 100C)	10	10	10	10	10	10	10	10	7.6
Flow Co-efficient - Mixing	Cv	16.2	28	49	83	8.1	12.5	19.6	47.5	144
	Kv	14.1	24.3	42.5	72	*7*	*10.9*	*17*	*41.3*	*125*
Flow at given pressure drop across the valve (dP)	USgpm @ 29 psi dP	88	151	265	448	44	68	106	257	778
	lpm @ 2 bar dP	332	573	1002	1697	*165*	*257*	*401*	*973*	*2946*
Minimum Mixing Flow for Factory set control with the Mixing Orifice	USgpm	-	-	-	-	0.9	4.7	6.9	19	53
	lpm	-	-	-	-	*4*	*18*	*26*	*70*	*200*
Valve Body Only	lbs	3.3	5.5	12.1	20.9	4	5.5	11	22	100
	kg	*1.5*	*2.5*	*5.5*	*9.5*	*2*	*2.5*	*5*	*10*	*45.5*
Valve with Actuator	lbs	22	24.2	30.8	50.6	23	24.5	30	49	117
	kg	*10.5*	*11*	*14*	*23*	*10.5*	*11*	*13.6*	*22.2*	*43*
Actuator Emech		G1.2	G1.2	G1.2	G1.3	G1.2	G1.2	G1.2	G1.3	G1.3

In the manufacturing environment, time is money and accuracy is critical. In every Emech™ installation, manufacturers are achieving tighter controls that are now providing cost savings and production improvements. We invite you to visit our website to discover these new developments, or contact us below:

Corporate Office:

981 Park Center Dr
Vista, CA 92083

Distributor:

Freecall USA (1866) 5839 248
Freecall NZ (0800) 893 070
Freecall AUST (1800) 029 876
www.emechcontrol.com

This is the exhibit marked"PJJ-8"
referred to in the affidavit of
Peter James Jeromson
sworn before me this 26/04/2004

NATALIE SARAH ETHEL BANNISTER
Solicitor of the High Court of New Zealand

Saether Patent Review By Peter Jeromson

The essential requirement for the specification of our valve invention demanded full electronic control of temperature mixing and On/off functionality. We wanted one motor, a very low cost mechanical construction and the ability to have 100 percent flexibility in interface design which means full electronic control and optional remote access.

The Saether valve requires a second actuator or manual shut off as the motor is limited to control the mixing function. Manual shut off also limits the positioning of the valve to the point of use.

Bends, angles and corners cause friction in a stream which decreases flow. The flow path through the Saether valve is not efficient given that the flow travels through the fixed disk, up into a cavity on the rotating disk and back down through the fixed disc again before exiting the valve. This may have been deliberate so as to mix the stream before the temperature sensor. In our valve the flow path is much less arduous between entry and exit of the valve so that the effect of friction is minimised. Also we use a method of spinning the water past the temperature sensor in order to achieve a very accurate mixed signal.

For a given flow the disc diameter (and contact area) is not optimised which is important in the consideration of the required torque that the motor must overcome. Particularly in cases whereby the disc has had a lot of use and "lapped" itself together increasing torque or had a built up off salts from intermittent operation such that the force to open is excessive.

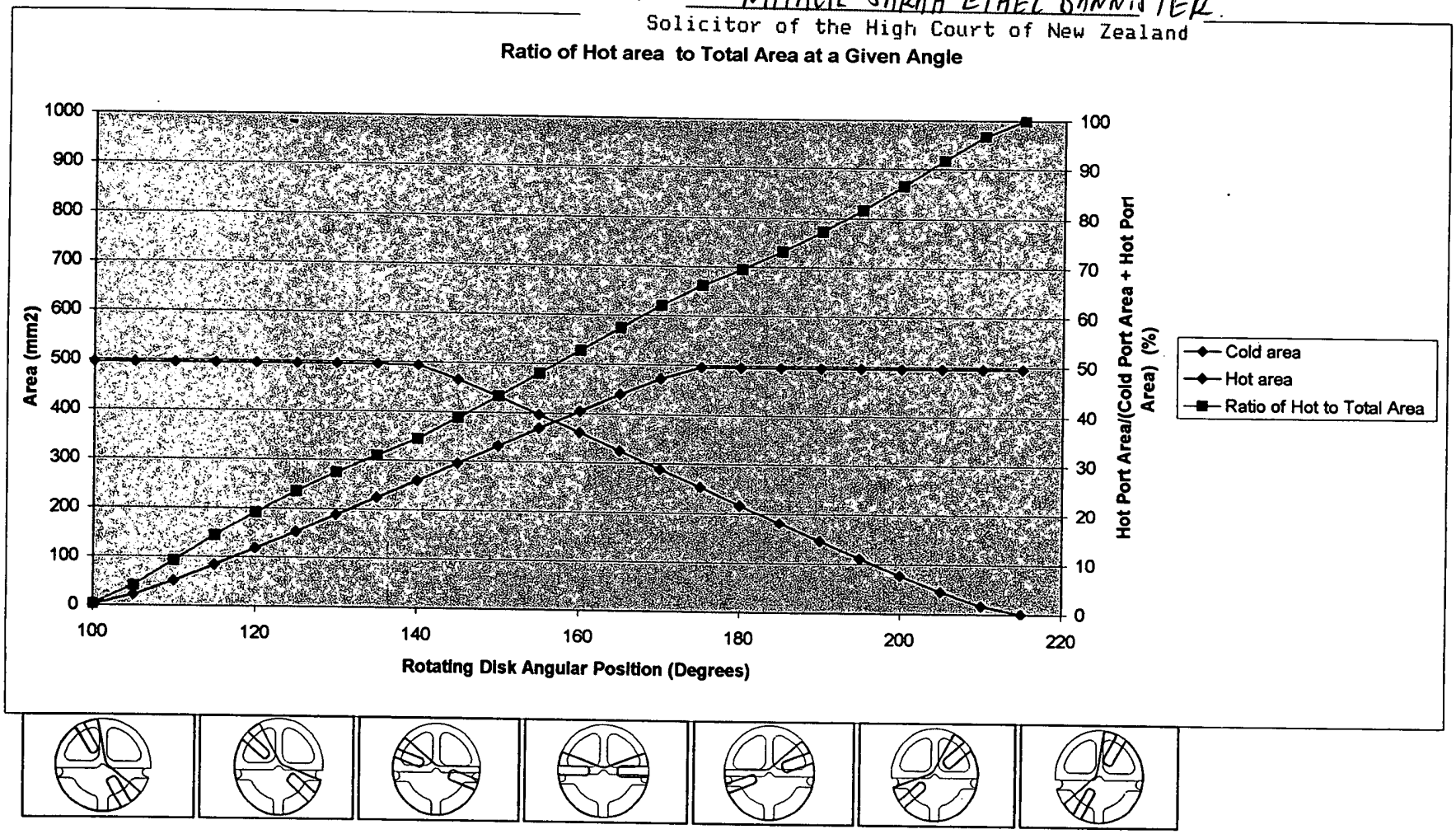
The motor specified is not suggested as a stepper and the mechanical design and block diagram indicate it as a DC motor. A disadvantage of these motors is that more gearing is required resulting in more backlash which becomes excessive with wear. Typically a DC motor runs at 2 – 8 thousand RPM under minimal load and 1 thousand RPM under load. Also DC motors which are small in diameter (as with the motor depicted) have higher operating speeds. Our comparable stepper motor operates at speeds of up to 90 RPM and required minimal gearing. The DC motor would have also more wind up angular error when under higher torque conditions. In an application where very fine forward and reverse control in required and may be continuous, any backlash in the gearing makes accurate mixing more difficult to achieve. Human skin detects temperature changes of less than 1 degree Fahrenheit.

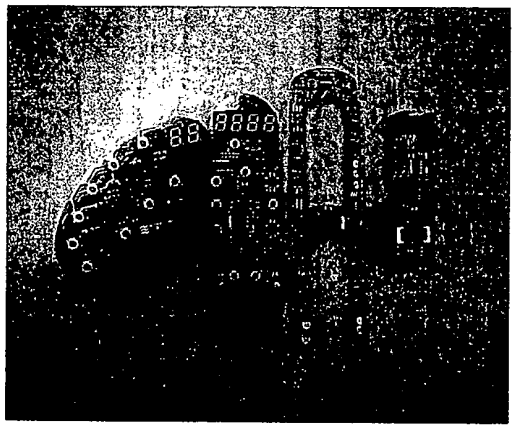
DC motors have brushes which wear out. Stepper motors have no contact between stator and rotor.

This design is not economically scaleable for wider applications.

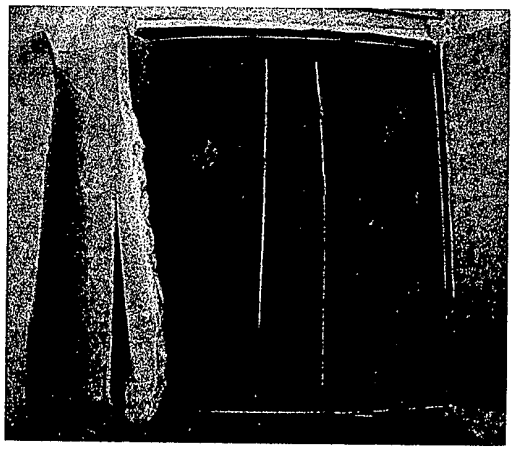
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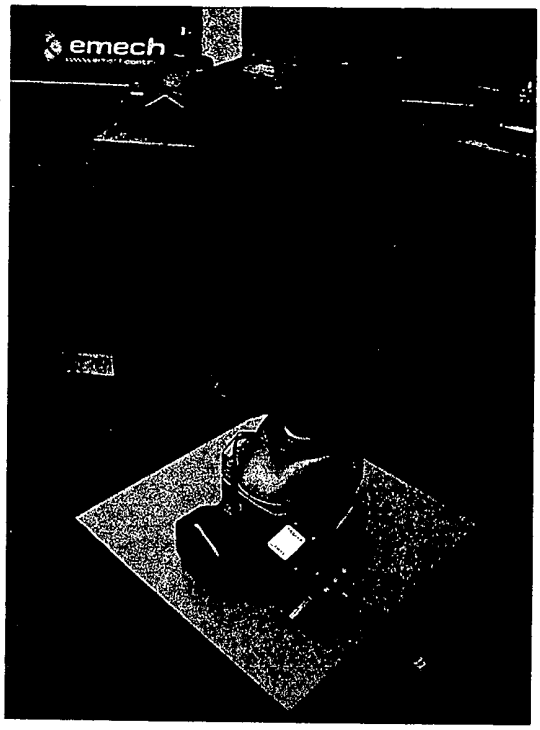




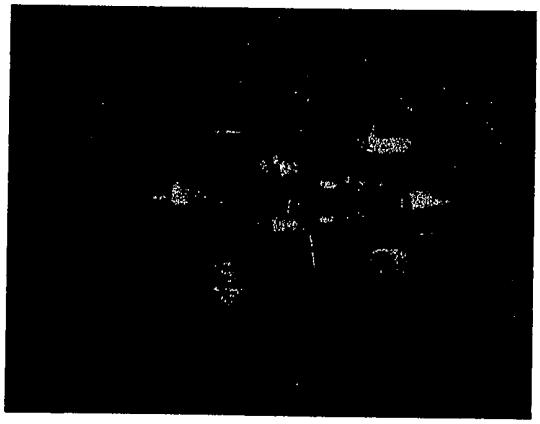
Interface and valve controller boards had to be designed. Shown from left are the bath filling interface, the shower interface, the faucet interface and on the right the valve controller. The finaly version of the valve controller was half this size.
Software was written to control the valve and was stored in a micro on the controller boards.
Schematic circuit design, printed circuit board design and control system software design and testing was all completed within The Unique Company.



The worldwide search for discs failed and resulted in us having to custom make our own discs.
In addition to the disc tooling required a minimum of 40,000 sets of discs had to be purchased from Morgan Matroc.



After the sal to American Standard the valve was scaled for industrial applications. Coorstek of the USA was the only company found that could manufacture the larger discs efficiently.
This industrial control valve is truly unique. Under normal conditions control to within +/- 1.8 F is achieved. The unit is plug and play, other systems have separate sensors, valves and PLCs which all have to be tuned to work together. Installation is simpler, the valves are much faster due to the tight control loop and more reliable.
Sales are unfolding to the meat, dairy, pelt wash and wool scouring industries.
The small shower valve can be seen to the bottom right.



Initial development had us trialing solenoid valves as in the 2 valve bodies to the left. The valve on the right was the first valve using ceramic discs which in this case were standard off shelf 2 port valve disc sets available from many manufactuerers.



Progressing on from the 2 motor version to the left, a single motor version was made. The valve second from the left is the first single spindle valve made. The valve then developed into the final version on far right.

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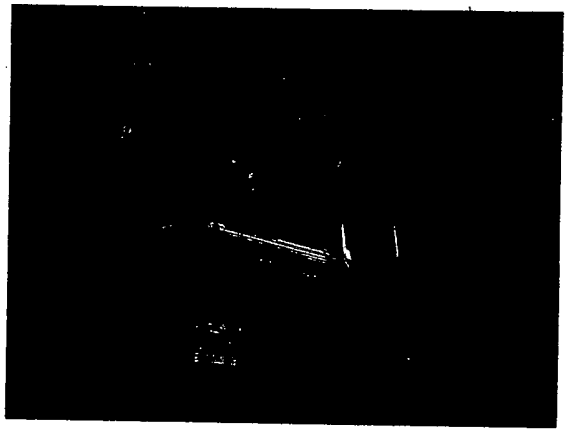
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6 Photo History.

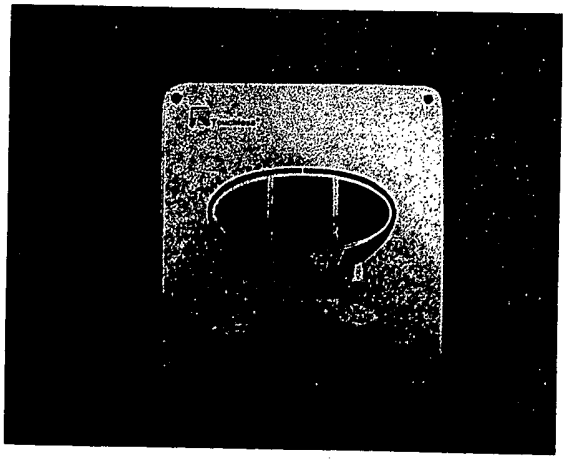
The Unique Company / Emech Control.



These are some of the valves, gearboxes and circuit boards hand made during the development process between 1994 and 1988.



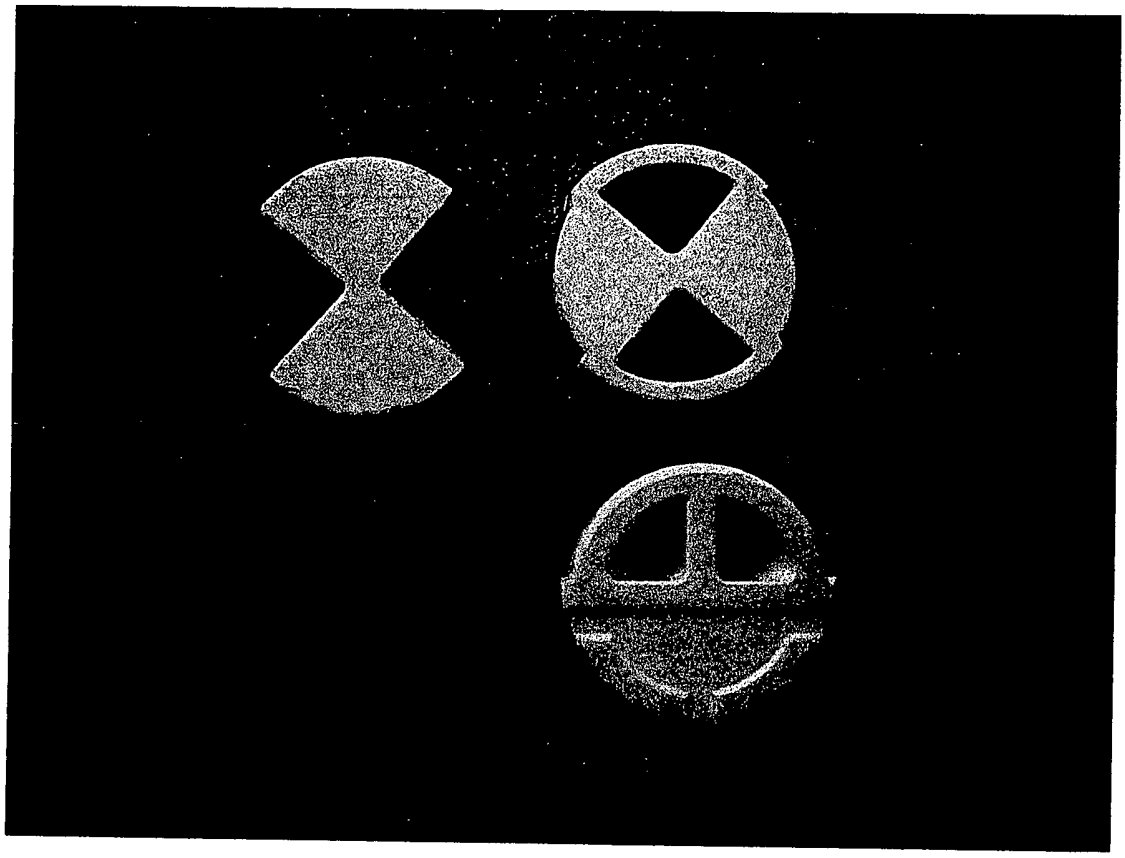
These samples were presented to American Standard and resulted in a successful technology sale. The rights were limited to consumer product within their current range ie baths and showers. Missing from this picture is fully the touchless hand wash faucet. Full electronic control renders the valves capable of connecting to a limitless array of remote interfaces. The hand held faucet allows thumb control of on/off and also temperature. (Uses hairdressing, nursing.)



Another example of an interface is this simple touchless version using an infra red switch. An advantage over the schaeffer valve is that the disc/valve design allows on-off function with a single motor. The motor then is able to operate remote to the interface.
This interface also demonstrates the low cost options available to compete with current market manual valves.
American standard considered thes ideas novel.

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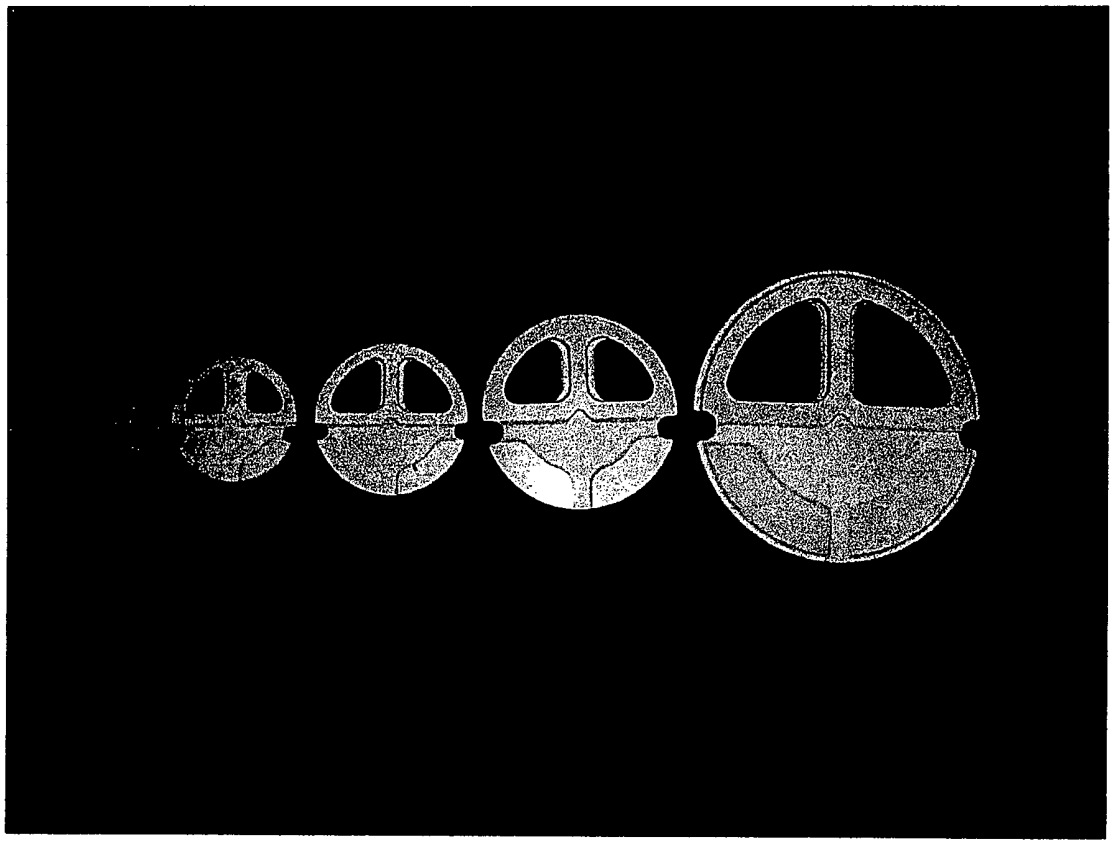
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Commercially available 2 port disks (top), Unique 3 port disks (bottom).

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The first mixing valve disc developed is to the left, 4 other disk sizes were later scaled for larger pipe sizes - ¾" to 2" Nominal bore.